BOSTON WATER WORKS.

ADDITIONAL SUPPLY.

SECTION A

OF THE

SUDBURY RIVER CONDUIT,

1877.

TO CONTRACTORS.

Sealed proposals, indorsed "*Proposals for Building Section A of the Sudbury River Conduit,*" will be received at the office of the Boston Water Board, City Hall, Boston, until 12 o'clock, M. of Thursday, the 17th day of May, 1877; and at that place and time will be publicly opened and read.

Bidders are required to state in their proposals their names and places of residence, and to declare that no person, appointed or employed by virtue of any city ordinance or legislative act relative to the supplying of water to the City of Boston, has any interest in the proposal or contract; and also that the proposal is in all respects fair, and made without connection or collusion with any other person making proposals for the same work.

Bidders will state the proposed price for each separate item of the work, by which the bids will be compared. These prices are to cover all the expenses incidental to the completion of the work in full conformity with the specifications.

N. B. The prices proposed must be stated both *in writing* and *in figures*, and all proposals containing bids not called for in this advertisement will be considered informal. Each bid must be signed by the bidder, and accompanied by a bond for $ [illegible] conditioned for the execution of the contract (with a satisfactory bond for its performance) within the time specified in this advertisement, in case the bid be accepted, — or in lieu of the bond to accompany the bid a sum of money or other satisfactory collateral security in the same amount may be deposited with said Water Board. But the bond for the performance of the contract must be a written bond, with satisfactory sureties.

The sureties of the bonds, both for the proposals and for the contract, must be satisfactory to the Water Board. No bid will be considered which has not responsible sureties upon its accompanying bond.

The person or persons to whom the contract may be awarded will be required to appear at this office, with the securities offered by him or them, and execute the contract within four days (not including Sunday) from the date of notification of such award, and the preparation and readiness for signature of the contract; and in case of failure or neglect to do so, he or they will be considered as having abandoned it, and the bond or deposit shall be forfeited to the City of Boston.

The work is to commence within ten days after the execution of the contract, and to be continued with regularity until its completion, which completion must be before the 1st day of _____, 187 .

The bids will be compared on the basis of the Engineer's estimate of quantities of work to be done, which is as follows: —

(*a.*) 1 00 Cubic yards of earth excavation.
(*b.*) 100 " " soil dressing.
(*c.*) _____ " " rock excavation.
(*d.*) 100 " " concrete.
(*e.*) 100 " " brick masonry.
(*f.*) 10 " " rip-rapping.
(*g.*) 20 " " dry rubble-stone paving.
(*h.*) 100 " " rubble-stone masonry in mortar.
(*i.*) 15 " " floor-paving in mortar.
(*j.*) 0 " " dimension-stone masonry, with cut faces, in mortar.
(*k.*) 20 " " dimension-stone masonry, quarry-faced, in mortar.
(*l.*) 0 M. feet B. M. of spruce lumber, placed.

These quantities are to be considered as only approximative, being given merely as a basis of comparison; and the Water Board, therefore, expressly reserves the right of increasing or diminishing the same, as may be deemed necessary by its Engineer.

Specifications may be obtained at the office of the City Engineer, City Hall, Boston, and plans may be seen at the Engineer's office of the Boston Water Works, at South Framingham.

The amount of security required will be such sum as may be fixed by the Water Board after the proposals are opened; said sum not being

less than one-fourth nor more than two-thirds of the amount of the contract.

The attention of bidders is particularly called to the foregoing conditions, and they are requested to use the following form of proposals in making their bids.

The Boston Water Board reserves the right to reject any or all bids, should it deem it to be for the interest of the City of Boston so to do.

T. T. SAWYER,
Chairman.

OFFICE OF BOSTON WATER BOARD,
City Hall, Boston, March, 1877.

PROPOSALS,

To the Boston Water Board, for building Section A of the Sudbury-River Conduit.

Made by _____

residing in _____

dated _____

_____

_____

do hereby declare that no person appointed to any office, or employed by virtue of any ordinance of the City of Boston, or any act of the Legislature relating to the supplying of water to said city, is directly or indirectly interested in this proposal, or in the contract proposed to be taken, or the supplies or works to which it relates, or in any portion of the profits thereof; also that _____ have carefully examined the annexed specifications and form of contract and the plans, and _____ will contract to provide all necessary tools, apparatus, implements, centring or forms, and to do all the work and furnish all the materials called for by the annexed contract and specifications, in the manner and on the conditions required, upon the following terms, to wit: —

(*a.*) For all earth excavation and disposal of material in embankment or refilling of trenches (rolling, ramming and watering wherever required), in grading or regrading of roads and lands, or in spoil banks, — including all clearing and grubbing, all sheeting and shoring and removal of same, all coffer-dams and removal of the same, the

accommodation of travel on intercepted roads, all restoring of fences, and all pumping, bailing or otherwise disposing of water, the sum of

_____

_____ ($ _____) per cubic yard.

(*b.*) For all dressing of embankments or other surfaces with soil, the sum of _____

_____ ($ _____) per cubic yard.

(*c.*) For all rock excavation, including disposal of material either in construction or in spoil banks, as may be required, the sum of

_____

_____ ($ _____) per cubic yard.

(*d.*) For all concrete work in place, the sum of _____

_____ ($ _____) per cubic yard.

(*e.*) For all brick masonry, the sum of _____

_____ ($ _____) per cubic yard.

(*f.*) For all rip-rapping, the sum of _____

_____ ($ _____) per cubic yard.

(*g.*) For all dry rubble-stone paving, in place, the sum of

_____

_____ ($ _____) per cubic yard.

(*h.*) For all masonry of rubble stone laid in mortar, the sum of

_____

_____ ($ _____) per cubic yard.

(*i.*) For all floor paving, laid in mortar, the sum of _____

_____ ($ _____) per cubic yard.

(*j.*) For all masonry of dimension stone with cut faces, laid in mortar, the sum of _____

_____ ($ _____) per cubic yard.

(*k.*) For all masonry of dimension stone, quarry faced, laid in mortar, the sum of _____

_____ ($ _____) per cubic yard.

(*l.*) For all spruce lumber, except that used for sheeting, coffer-dams, and other temporary purposes, placed, the sum of _____ _____ ($ _____) per M. feet B. M.

Signed, _____

_____

_____

Know all Men by these Presents,

That we _____

_____ as principal

_____

_____

_____ as suret

are held and firmly bound unto THE CITY OF BOSTON, in the sum of 2500 dollars, lawful money of the United States of America, to be paid to the said CITY OF BOSTON, or its certain Attorney, its successors and assigns, for which payment, well and truly to be made, we bind ourselves, our heirs, executors and administrators, jointly and severally, firmly by these presents.

Sealed with our seals, dated the _____

day of _____

in the year one thousand eight hundred and seventy-seven.

Whereas, The said _____

_____

ha made a proposal to the Boston Water Board, bearing date the

_____ day of _____ one

thousand eight hundred and seventy seven, for building section A of the Sudbury-river conduit;

Now, the condition of this obligation is such,

That, in case_____proposal be accepted by the Boston Water Board, if the said_____

_____

_____

_____

_____

shall execute a contract with said city, under the conditions of said proposal, with a bond for its performance approved by said Water Board within the time provided for by the advertisement for proposals annexed hereto, then this obligation shall be of no effect; otherwise it shall remain in full force and virtue.

_____ (Seal)

_____ (Seal)

_____ (Seal)

_____ (Seal)

_____ (Seal)

SIGNED AND SEALED in presence of

_____

_____

BOSTON WATER WORKS.

ADDITIONAL SUPPLY.

BOSTON, 1877.

Contract and Specifications

FOR BUILDING

SECTION A OF THE SUDBURY-RIVER CONDUIT.

This Agreement, Made and concluded this _____

_____ day of _____

in the year one thousand eight hundred and seventy-seven, between the CITY OF BOSTON, by THE BOSTON WATER BOARD, of the first part, and _____

_____

of _____, in the State of

_____

_____, part of the second part:

A. ***Witnesseth,*** That the said part of the second part ha agreed, and by these presents do agree with the said party of the first part, for the consideration hereinafter mentioned and contained, and under

the penalty expressed in a bond, bearing even date with these presents, and hereunto annexed, at _____ own proper cost and expense, to do all the work and furnish all materials called for by this agreement, in the manner and under the conditions hereinafter specified, and ha further agreed that the said Water Board shall be and is hereby authorized to appoint, from time to time, such Engineer, Assistants and Inspectors as it may deem proper, to act under the directions of the City Engineer in inspecting the materials to be furnished and the work to be done under this agreement, and in seeing that the same strictly correspond with the specifications hereinafter set forth.

B. To prevent all disputes and litigation, it is further agreed by and between the parties to this contract, that the City Engineer shall, in all cases, determine the amount or the quantity of the several kinds of work which are to be paid for under this contract; and he shall decide all questions which may arise relative to the fulfilment of this contract on the part of the Contractor; and his estimates and decisions shall be final and conclusive. Any materials condemned or rejected by the City Engineer, or his representatives, may be branded or otherwise marked, and shall, on demand, be at once removed from the work.

C. SPECIFICATIONS.

Location. (1.) The section of conduit (to be known as section A) covered by this contract and these specifications is to be built in the Cove of Evanston on a line commencing at Dodge street [illegible] thence running about 1070 feet [illegible]

~~It includes also some excavation and masonry to be done in the "Lawrence Basin" of Chestnut-hill Reservoir, to contain the 48-inch iron outlet pipe, conveying the water of Sudbury river into said basin.~~

(2.) The Contractor is to do all clearing and grubbing, all excavation, both in earth and rock, all ditching, pumping and bailing, all sheeting and shoring, all coffer-dams, all brick, stone, concrete and timber work, and to furnish all materials for the same; also to set in the masonry all iron work furnished by the city; to make all embankment and all refilling in trenches, to maintain crossings at all intercepted roads, to grade and regrade roads and farm crossings, lands, etc., to clear away all rubbish and surplus material, and, in short, is to furnish all materials, tools, implements and labor required to build and put in complete working order the specified section of conduit, about ~~[illegible]~~ feet in length, with all its appertaining structures (excepting the water-gates and other iron-work and the superstructure of gate-houses), to restore all fences, etc., and to leave the grounds in neat condition: the whole to be done in accordance with the agreement and specifications herein set forth, and the requirements, under them, of the Engineer. Work to be done.

(3.) The following are the approximate quantities of the work required to be done; they are to be considered as approximate only, and the Water Board, therefore, expressly reserves the right of increasing or diminishing them, as may be deemed necessary by its Engineer. Quantities.

The profiles, showing the character of the excavations, are made from soundings, and are believed to be in the main correct; but should the character or extent of the various materials be found different from what is indicated, the Contractor shall have no claim on that account; and it is expressly understood that the city does not warrant them to be correct: —

(*a*.) ~~[illegible]~~ Cubic yards of earth excavation.
(*b*.) ~~[illegible]~~ " " soil dressing.
(*c*.) ~~[illegible]~~ " " rock excavation.
(*d*.) ~~[illegible]~~ " " concrete.
(*e*.) ~~[illegible]~~ " " brick masonry.
(*f*.) ~~[illegible]~~ " " rip-rapping.
(*g*.) ~~[illegible]~~ " " dry rubble-stone paving.

(*h.*) 300 Cubic yards of rubble-stone masonry in mortar.
(*i.*) 15 " " floor-paving in mortar.
(*j*) 10 " " dimension-stone masonry, with cut faces, in mortar.
(*k.*) 20 " " dimension-stone masonry, quarry faced, in mortar.
(*l.*) 130 M. feet B. M. of spruce lumber, placed.

Form and dimensions.

(4.) The form and dimensions of the conduit, embankments, road crossings, foundations, outlet-chamber, man-holes, etc., shall conform accurately to the plans and directions given from time to time, and in no case will any work in excess of the requirements of the plans be paid for, unless ordered by the Engineer.

Surplus materials.

(5.) All refuse matter from clearing and grubbing, all débris of construction, and all material from excavation, when unfit or not needed for use in the work, shall be removed from the land of the city by the Contractor, at his own expense.

EARTH AND ROCK WORK.

Clearing and grubbing.

(6.) The ground surface shall be cleared over all excavations, and cleared and grubbed under all embankments, to such widths as the Engineer may direct. All timber, brush, stumps, roots, and other perishable material shall be burned up or removed beyond the limits of the conduit lands.

Soil.

(7.) The soil shall be excavated and stored in spoil banks for subsequent use, if wanted.

Soil dressing.

After the embankments are formed and the trenches refilled, the surfaces of the same and the slopes of the excavations, wherever may be directed, shall be neatly covered with soil lightly compacted by ramming or rolling, to the satisfaction of the Engineer; the amount of soil deposited shall be measured in place after being compacted; the thickness of the soil shall vary from about 4 to 8 inches.

Removing road metal.

(8.) The road-metal forming the surface of the roads under which the conduit is to pass, shall be carefully removed and stored in spoil banks for subsequent use.

After the trenches are refilled to the designated height, the said road

metal shall be spread over the excavated parts in such depths as shall be directed, and compacted by rolling.

For each operation, the work is to be estimated and paid for as earth excavation.

Earth excavation and disposal of materials.

(9.) The excavations in conduit trench and foundation pits, base for embankments, etc., shall be made to the lines and grades to be given by the Engineer from time to time, and in such manner and to such widths as will give ample room for building the structures they are to contain, and for pumping or draining, when necessary. The material from the excavations, when of acceptable quality and needed for the purpose, shall be used in embankments, refilling of trenches and pits, regrading roads and grading farm crossings, lands, etc., as may be directed; the surplus, if any, shall be removed from the city's land and disposed of at the expense of the Contractor.

The materials from the trenches shall be so deposited as not to endanger the work. Wherever the conduit is to be built on a side-hill adjoining swampy land, the muck or mud shall be removed first; the material from the side-hill, necessary for the work, shall then be deposited on the location of the mud or muck excavation, in such depths as the Engineer shall designate, before the conduit is built.

Rock excavation.

(10.) Only such ledge rock as requires blasting for its removal, and boulders of one cubic yard or more in volume, will be estimated as rock excavation. Such of the rock as is of proper quality and shape may be used for rubble masonry, concrete, and paving. A portion may be required for other purposes, as hereinafter specified; the rest must be removed from the city's land and disposed of at the expense of the Contractor.

Conduit trench.

(11.) The conduit trench in earth shall generally have a bottom width, at conduit grade, of ~~sixteen~~ Seventeen feet, unless otherwise directed.

In rock, the width of the trench shall be fixed by the Engineer as the work progresses.

The conduit grade is the under side of the concrete foundation or of the plank platform supporting the conduit.

The excavation shall be estimated and paid for as if made with side slopes of one horizontal to one vertical (45°) when in earth, and one horizontal to four vertical when in rock; and in no case will

excavations extending beyond such maximum slopes, or below grade, be paid for, unless made by order of the Engineer. This applies to the conduit trench only, above grade; all other excavations shall be estimated according to the quantities actually excavated as per the lines given.

In excavations where the depth of cutting is less than thirteen feet, the Contractor may, if he desire, and the nature of the material will safely admit, adopt steeper slopes than 45°, or he may adopt vertical sides, provided he support the same with sheeting and shoring or otherwise, at his own expense, but the work shall be estimated, as before stated, as though excavated with slopes of 45°.

When the depth of cutting exceeds thirteen feet, the excavation must be made to the full size as estimated, unless otherwise permitted or directed by the Engineer.

If, in the opinion of the Engineer, the material at or below grade line is of improper nature for a foundation, it shall be removed to such depths and widths, and in such manner, as he may direct, and other material shall be deposited in its place, as hereinafter specified.

Sheeting and shoring.

(12.) If sheeting and shoring be used, great care should be exercised by the Contractor to prevent, by proper bracing and by any other necessary means, any movement of the sides of the excavations which could in any way injure the masonry, diminish the width necessary for proper drainage, or otherwise injure or delay the work.

As the trenches are refilled, the sheeting, etc., shall be carefully removed in such manner as to prevent the caving in of the sides of the cuts, and the vacancies left shall be carefully filled by ramming, watering or otherwise. No payment will be made for the material or work of sheeting and shoring as such, it being understood their cost is to be covered by the price bid for excavation.

Maintaining excavations.

(13.) The Contractor shall maintain the excavations in good order during construction, so as not to hinder or injure the mason work in any manner; all slides or eaves to be at his cost. He shall do all the draining, bailing or pumping necessary to keep the trenches and other excavations free from water, without claim for other compensation than the price paid for excavation; and if the trench bottom be taken out below grade, except by order of the Engineer, it shall be filled to grade in such manner as the Engineer may direct, at the Contractor's expense.

(14.) The refilling of trenches and foundation pits shall be made with approved materials, free from all perishable matter, *and around and about the conduit and other masonry the work must be done with great care.* The material shall be *thoroughly* rammed in thin layers, and well moistened, and if, at any time, the number of men employed in compacting the earth is not sufficient, the Contractor shall increase such number, upon the requisition of the Engineer. The back filling behind the side-walls of the conduit shall not be begun till the brick invert is laid, and the filling must be carried on evenly and simultaneously on both sides of the conduit to the top of the arch, so that no unbalanced pressure may be thrown upon the masonry. The conduit trench will, in general, be refilled to a height of four feet above the top of the arch, but, if required by the Engineer, it shall be refilled to the original surface of the ground and be neatly dressed. Wherever the refilling is left below the original surface of the ground, the exposed slopes of the excavation shall be trimmed to even surfaces, and shall be dressed with soil if ordered. Refilling.

(15.) The embankments, road crossings, etc., shall be made to the grade, form and dimensions that may be directed by the Engineer, and when accepted must be full to the required lines. Those covering the conduit will, in general, be four and a half feet deep over the crown of the upper arch, and twelve feet wide on top, with slopes of one and three-quarters horizontal to one vertical, unless otherwise directed. They shall start from a firm and well-prepared base, from which sod, mud, muck, and all other perishable matter shall have been removed, and stepped on sloping ground, if required. Embankments, etc.

All embankments and filling below the spring-line of the arch shall be made with approved material, free from soil and perishable matter, in 6-inch horizontal layers, thoroughly wet and rolled with heavy grooved rollers, or rammed in places where the roller cannot be effectively used. They shall be brought up to grade during the first season of the work, and shall be allowed to stand all winter (or until the Engineer is satisfied as to their firmness), before building any masonry upon them. Foundation embankments.

The covering embankments shall be made with approved material, and brought up in layers about 8 inches in thickness, well compacted by rolling or ramming, and watered, and the work shall be kept at a Covering embankments.

uniform height on both sides of the conduit. Special care will be required in making the embankment behind and about the side-walls of the conduit, and no pressure must be brought upon the side-walls till the brick invert is laid.

Embankments or filling for roads, etc.

(16.) Roads and farm crossings will be made or regraded accurately to the lines given, and adjacent land graded up at such places and in such manner as the Engineer may direct. The filling shall be made in layers, but will not be required to be rolled or rammed, except near the conduit. ~~6 inches in thickness and thoroughly rammed.~~

Rock filling.

(17.) Rock excavated from the trenches shall be used in such manner as the Engineer may direct, for making and protecting the embankments and roads. Wherever used for protecting banks, or in other exposed positions, care shall be taken to form a reasonably even external surface.

Measurements.

(18.) All earth and rock work shall be measured in excavation, except soil-dressing, which will be measured in place.

CONDUIT.

Dimensions of conduit.

(19.) The general section of the conduit is to be made to conform to the drawings furnished by the Engineer, and will generally be Six feet and 88/100 (6.88) high, and Seven 1/2 (7.5) feet wide, inside dimensions. It is to be built with hard bricks and rubble masonry, laid in hydraulic mortar upon a foundation of concrete or timber.

Foundation.

(20.) The foundation will be of concrete, of the form and dimensions shown on the plans, except where the nature of the surrounding earth would render such construction unadvisable. In such cases the whole or a portion of the concrete may be omitted, and a platform of timber substituted; and in cases where the upward pressure of water is considerable, the invert or bottom arch, if required, will consist of two rings or courses of brick. The precise nature of the foundation at any given point cannot be determined in advance, but shall be decided upon by the Engineer, as occasion demands; and he may at any time alter the character of the work or any portion of the conduit, or its appurtenances, where he may deem it expedient.

Side-walls.

(21.) The side-walls of the conduit will generally consist of rubble-

stone masonry, laid in mortar, as hereinafter described, and lined with a single course of brick-work.

Water-tight work is aimed at, and to this end, in addition to the general good quality of work required, the interior faces of the rubble walls will be thoroughly plastered with hydraulic mortar as high as the spring line of the covering arch, before the brick lining is laid.

Arches and lining.

(22.) The brick part of the conduit, comprising the invert, wall-lining and covering arch, shall be laid with one, two or more courses of brick, according to the drawings furnished, or to the direction of the Engineer. The bricks shall be laid to a line with the beds in the line of the radii of the curves. The inside faces of the joints of the bottom arch and of the side-walls shall be neatly pointed, and those of the upper arch, after the centres have been withdrawn, shall have all the mortar projecting beyond the surface of the bricks scraped off, not more than fifteen days after the arch has been covered, and shall be left in a neat condition. The extrados of the upper arch shall be plastered with a thick coating of hydraulic mortar.

The work must be made water-tight at all points, and if, after the conduit is completed, leaks are discovered, the openings must be caulked or otherwise stopped. Any defects in the work, discovered at any time, shall be immediately corrected, even if it be necessary to take down and rebuild portions of the conduit.

All unfinished work must be "racked back," and when new work is joined to its surfaces, the bricks must be cleaned and moistened.

Line and grade.

(23.) The centre line of the conduit is to conform truly in direction with the surveyed line, and the grade shall conform accurately to the levels given by the Engineer.

Centres and moulds.

(24.) Strong centres, made to fit the curves in the line of the conduit, and moulds or forms, satisfactory to the Engineer, shall be provided by the Contractor; and when these lose their proper dimensions or shape, they shall be replaced by others.

Removing centres.

The centres upon which the top arch is formed shall not be removed until the covering embankment or the back-filling in open trenches is raised at least two (2) feet above the top of the arch, unless otherwise directed.

Man-hole.

(25.) Several man-holes will be constructed where the Engineer shall direct.

Outlet chamber, etc.

(26.) The outlet chamber, slope walls, and other structures pertaining to the conduit shall be made to conform accurately to the plans provided. Care shall be taken to secure good foundations, and the pits or excavations in which they are built shall be properly drained or freed from water during construction.

Sheet piling.

(27.) Sheet piling must be driven wherever required, to prevent water from undermining walls or paving. Due precautions must be taken to prevent the caving-in of earth upon which walls or any structures are to be built.

Protection from frost, etc.

(28.) All unfinished masonry shall be properly protected during inclement weather from injury from water or frost.

Iron-work.

(29.) All castings or other iron-work furnished to the Contractor shall be built into the masonry wherever and in the manner required.

CEMENT.

(30.) All cement furnished by the Contractor for the work herein specified will be subject to inspection and rigorous tests, and if found of improper quality must be immediately removed from the work; the character and severity of the tests to be determined by the Engineer.

It shall be the best quality of hydraulic cement, fresh ground, and must be put up in well-made casks, so as to be reasonably secure from the air.

When stored, it shall be kept in a tight building, free from draughts of air through it; and each cask must be raised several inches above the ground, by blocking or otherwise, so as not to be liable to absorb moisture.

It shall be of American manufacture, unless the Engineer, in special cases, shall direct that Portland or other foreign-made cement shall be substituted therefor. In such cases the Contractor shall make the required substitution, and the difference in cost between the American and foreign cement, for the quantity actually used, shall be estimated and paid to him.

MORTAR.

(31.) All mortar, except for pointing exterior work, shall be prepared from cement of the quality before described, and clean, sharp

sand, free from loam. These ingredients shall be thoroughly mixed dry, in the proportion of one part, by measure, of cement to two parts of sand, and a sufficient quantity of water is to be afterwards added to produce a paste of proper consistency; the whole to be thoroughly worked with hoes or other tools.

The mortar shall be freshly mixed for the work in hand, in proper boxes made for the purpose; and any mortar that may have been left standing longer than one hour shall not be used.

CONCRETE.

(32.) The concrete shall be formed of clean gravel or of sound and acceptable broken stone, not exceeding two and a half inches at their greatest diameter. All stone in any way larger will be thrown out.

The materials to be cleaned from dirt and dust before being used; to be mixed in proper boxes, with mortar of the quality before described, in the proportion of five parts of gravel or broken stone to one part of cement; to be laid, immediately after mixing, in layers of six inches in thickness, and, when put in place, to be thoroughly rammed till the water flushes to the surface.

The concrete shall be allowed to set for at least twelve hours, or more, if so directed, before any work shall be laid upon it, and no walking over or working upon it shall be allowed while it is setting.

BRICKS.

(33.) The bricks shall be of the best quality of hard bricks, burnt hard entirely through, and regular, and uniform in shape and size. They are to be culled before laying, and all bricks of an improper quality, and all "bats" shall be laid aside and removed; the Engineer to be furnished with men for this purpose by the Contractor.

Specially moulded bricks, of the quality above described, but of the section shown in detail drawings, will be provided by the Contractor and laid in the interior angles of the side-walls and invert, forming a continuous skew-back. Moulded bricks.

BRICK MASONRY.

(34.) All brick masonry shall be laid with bricks and mortar of the quality before described. No "bats" shall be used except in the

outside ring of the covering arch, where a moderate proportion (to be determined by the Inspector) may be used, but nothing smaller than "half bricks." The bricks to be wet before laying. Every brick to be completely imbedded in mortar under its bottom, on its sides and on its ends, at one operation. Care shall be taken to have every joint full of mortar. Competent mechanics shall be employed for this work, and for the invert especially, the best skilled labor shall be obtained.

STONE.

(35.) All stone used in the masonry of the conduit or its adjuncts must be of compact texture, free from loose seams and other defects, must be laid on its natural bed, except when used for paving, and be of size and shape to make good work of the kind.

RIP-RAPPING.

(36.) Rip-rapping shall be used to protect the approaches of the outlet chamber, ~~and the masonry containing the outlet pipe~~.

It may be used in and along the river, and at such other places as the Engineer may designate.

The stones used for rip-rapping shall be quarry stones of such sizes as shall be directed; they shall be carefully deposited, care being taken that the various sizes are mixed in due proportions.

DRY RUBBLE-STONE PAVING.

(37.) Dry stone paving shall be used on the slopes of the conduit embankment in the river and near Farm pond; it may be used for the open water-ways over the conduit, and at whatever place the Engineer may designate. It shall be generally 12 inches deep, measured at right angles to the face. The stones may vary in thickness or rise from 6 to 15 inches, but at least three-quarters of them shall have a rise of 9 or more inches. The stone shall be of good shape to make tight and firm work, and the joints shall be nearly at right angles to the face for at least half their depth. No feather-edged stone to be used. They shall have a firm bearing against the earth-surface and shall be thoroughly pinned with small stones or spauls tightly driven,

and great eare shall be taken to make eaeh stone seeure in its plaee. All interstiees shall be filled with well-driven spauls. The eourse of stone at the base of the slope, wherever so ordered, shall be roughly shaped in the form of a skewbaek, as shown on drawings.

(38.) Dry rubble-stone masonry may be used, in small quantities, at sueh plaees as the Engineer may designate; the stone used shall be quarry stone of approved size, well bonded together with suffieient headers, and joints well broken, and shall be laid with no more spauls and pinners than are absolutely neeessary to fill the interstiees. Sueh masonry, made of dry rubble-stones, shall be classified in the estimate as dry rubble-stone paving.

RUBBLE-STONE MASONRY IN MORTAR

(39.) Shall be used for the side-walls of the eonduit, for the toe-wall of the eonduit embankment near Winter-street bridge, for the foundations of the outlet-ehamber ~~and outlet-pipe~~, and for any other parts that the Engineer may designate during the progress of the work. It shall be eomposed of quarry stone, of suitable size and shape for the work in hand, well bedded and laid in mortar.

The stones used shall present a good bed for materials of that elass, with a depth of bed equal to at least one and one-half times the rise of the stone, and their size shall vary aeeording to the part of the work where they are to be used. For the side-walls of the eonduit, the stones must have *not less* than one superficial foot of bed, exeept the spauls neeessary to fill up the interstiees. The stones used in the toe-wall, foundations, and wherever else the masonry may be of suffieient mass, shall have at least eight inehes rise and three superficial feet of bed. The headers must be in all eases of suffieient size to seeure a strong bond with the rest of the masonry; they must be used frequently.

Speeial eare shall be taken in the eonstruetion of the toe-wall immediately below Winter-street Bridge, with whieh it must be seeurely bonded, and large stones shall be used, of good shape, for that portion of the work.

Eaeh stone shall be laid on its largest bed, and shall be firmly bedded with uniform bearing. No spauling up under a stone, after it is laid, shall be allowed.

CUT-STONE MASONRY.

(40.) All stone masonry in the outlet-chamber and appurtenances, and in ~~the pipe foundation and~~ other work, not included in the foregoing classification, will be of cut granite stone, laid in mortar; the amount and quality of cutting varying according to location, as will be described. The stones used shall be free from seams and other defects, uniform in grain and color, and equal in quality to the best Rockport, Quincy or Gloucester granite.

No stone shall have a rise greater than the width of its bed. The work shall be measured according to the plans furnished by the Engineer, and only the quantity included within the neat lines of the masonry, as shown on the plans, will be estimated and paid for; in no case will any work in excess of the requirements of the plans be paid for, unless ordered by the Engineer.

(41.) All stones shall be lowered into beds of mortar prepared for them in their respective places, by means of derricks and lewises, unless otherwise permitted; and, wherever the beds are at an inclination too great for the mortar to stand thereon, the stones shall be laid dry, and then carefully grouted with clear cement, which shall be forced into the joints with suitable tools.

(42.) The cut-stone masonry shall be classified as Floor-paving in mortar and Dimension-stone Masonry.

FLOOR-PAVING IN MORTAR.

(43.) The paving of the floors of the gate-chamber, except all sill-stones, shall be classified as Floor-paving in mortar.

It shall be composed of granite stones of uniform depth, split and hammered into regular shapes, and laid in courses, on edge, in mortar of the quality before specified, with joints not exceeding one-half inch. The paving, when laid, shall present an even upper surface.

DIMENSION-STONE MASONRY.

(44.) All dimension-stone masonry shall be of granite, cut to specific sizes and patterns, and laid in mortar.

All beds and joints shall be dressed to surfaces, allowing of a three-

eighths-inch* mortar joint for full depth of stone. This shall not be construed as excluding stones whose joint-surfaces may have cavities or hollows of not more than six inches across, provided the total area of such hollows shall not exceed one-fourth the area of the face in which they exist. All grooves, water-ways, rabbets for screens, seats for gate-frames, etc., shall be dressed to smooth and true surfaces; and the cost of such dressing, of all bolt-holes, of cutting recesses and openings, and of setting all castings which have to be built into the masonry, shall be included in the price per cubic yard bid for masonry.

Dimension-stone masonry, with cut faces.

(45.) Dimension-stone masonry, with cut faces, will be used for the outlet chamber, outlet pipe, man-holes, etc., and the faces of all such stone shall be bush-hammered to solid and even surfaces, equal to that on sample-stone, in the Engineer's office of the Boston Water Works in South Framingham. Special care shall be taken to make the openings for water-ways *exactly* corresponding to the dimensions shown on the plans.

Dimension-stone masonry, quarry-faced.

(46.) The wing-walls and generally all exterior faces of structures (unless otherwise required) will be of dimension stone, but the faces will be left with the quarry surface, the edges being merely pitched to a line, and the included surface standing or projecting from one to two inches.

The quarry faces, when exposed to view, must not show any marks of the drill.

Stones having hollows or concavities within the plane of their faces will not be accepted.

Pointing.

(47.) All exterior work shall be pointed with mortar made from clear cement (without admixture of sand, lime, or other material), applied before its first setting.

SPRUCE LUMBER.

(48.) Spruce lumber ~~may~~ will be used for permanent sheet piling about foundations, and in the construction of wooden platforms for the foundation of the conduit or other structures, at such points, and of such description, as the Engineer may direct.

All lumber intended for permanent use shall be sound, straight-grained and free from all shakes, loose knots and other defects that may impair its strength and durability. The price bid for lumber shall

~~* Except for the platform around the outlet chamber, where the joints must not exceed one-eighth of an inch in thickness.~~

eover all ineidental expenses incurred for labor, or for tools or materials used in plaeing and seeuring the lumber.

No payment shall be made to the Contraetor for lumber used in sheeting, braeing, eoffer-dams, eentring and scaffolding, or for any other temporary purpose.

COFFER-DAMS.

(49.) The Contraetor shall ereet eoffer-dams, satisfaetory to the Engineer as regards suffieieney and loeation, to proteet from water during construetion the wall at the bottom of the eonduit slope below Winter-street bridge and the foundation of the outlet ehamber in Farm pond; ~~and the excavation and masonry containing the outlet pipe in the Lawrence basin of Chestnut hill Reservoir;~~ he shall provide suitable pumping maehinery, which shall be maintained as long as it may be neeessary to ensure a perfeet exeeution of the work.

(50.) The level of the river and of Farm pond may be raised or lowered at any time during the eonstruetion of the work, when the Water Board will find it neeessary to do so for the wants of the eity.

~~(51.) In order to facilitate the work in Lawrence basin, the Water~~ Board will lower its level to at least elevation 120 above datum plane.

A portion of the trench for the outlet-pipe, through the reservoir bank, shall be done by the Contraetor, — so mueh of it as is below the high-water line in the reservoir, — and sueh trench, protected by the coffer-dam, shall be kept entirely free from water, at the expense of the Contraetor, during the time that the pipes shall be laid in it by the employés of the eity. The paving removed for the eonstruetion of the eoffer-dam and for the exeavation of the trench above described, ~~shall be neatly replaced, at the expense of the Contractor.~~

(52.) All eoffer-dams and other proteetion from water shall be built, and all pumping and bailing shall be done, by the Contraetor, at his own expense, and the eost thereof shall be ineluded in the priee bid for the work which is to be proteeted from water.

(53.) After the eoffer dams are removed, the earth used for their eonstruetion shall be so spread as not to obstruet the flow of water, and no point of its surfaee, after sueh spreading, must be above elevation 146 in the river below Winter-street bridge and in Farm pond. ~~elevation 116~~.

GENERAL SECTIONS.

Frost.

(54.) No mason-work of any description to be laid between the 15th of November and the 15th of April, nor at any time during freezing weather, except by special permission of the Engineer. No earth embankment nor refilling shall be made while there is sufficient frost to prevent perfect work.

(55.) Necessary conveniences, properly secluded from public observation, shall be constructed wherever needed, for the use of the laborers on the work.

Cleaning.

(56.) After the work is completed, the conduit shall be carefully cleansed of all refuse or rubbish. The surrounding grounds shall be cleared of all rubbish caused by construction, shanties, materials, etc., and left in a neat and presentable state, and all walls and fences of any description, that may have been damaged during the construction, shall be repaired and made good.

Forms and profiles.

(57.) Whenever required, the Contractor shall furnish the Engineer with all the necessary forms and profiles, and with the assistance needed to erect the same. Due facilities must be afforded the Engineer for giving grades, lines and points, and his marks shall be carefully preserved.

Incompetent men to be discharged.

(58.) If any person employed by the Contractor on the works should appear, to the Engineer, to be incompetent or disorderly, he shall be discharged immediately, on the requisition of the Engineer, and such person shall not again be employed on the works.

City and town laws.

(59.) In all the operations connected with the work herein specified, all city and town ordinances and laws controlling, or limiting in any way, the actions of those engaged on the works, or affecting the materials applied to them, must be respected and strictly complied with; and during the progress of the work the Contractor shall take all necessary precautions to protect life and property.

Roads to be maintained.

(60.) Wherever roads are intercepted by the conduit line the Contractor shall, at his own expense, provide suitable bridges or other sufficient crossings for the accommodation of the travel thereon, and shall maintain the same in good and safe condition until the roads can be restored, when all bridges and other temporary expedients shall be removed, and the roads left in a suitable condition for future use.

(61.) Special care shall be taken by the Contractor to keep Beacon street free from unnecessary obstructions, and open to traffic in a safe manner; over the conduit-trench a bridge, satisfactory to the Engineer for safety and strength, shall always be maintained, of a width of at least 20 feet, and provided with strong railings; and whenever said bridge must be shifted to a new position, for the convenience of the work, that operation shall take place during the night.

Inspection. (62.) All the work contemplated and described in this contract and specifications shall be done to the satisfaction of the Engineer, who shall be sole judge as to the fitness of materials, and shall have the right of correcting any errors or omissions in the contract and specifications when such correction is necessary for the proper fulfilment of their intention; the action of such correction to date from the time that the Engineer gives due notice thereof.

Imperfect work. (63.) Any unfaithful or imperfect work that may be discovered, before the final acceptance of the work, shall be corrected immediately, and any unsatisfactory material delivered shall be rejected, on the requirement of the Engineer, notwithstanding that they may have been overlooked by the proper Inspector, and estimated. The inspection of the work shall not relieve the Contractor of any of his obligations to perform sound and reliable work, as herein described. And all work of whatever kind which, during its progress and before it is finally accepted, may become damaged from any cause, shall be broken up or removed, so much of it as may be objectionable, and replaced by good and sound work satisfactory to the Engineer.

Orders. (64.) Whenever the Contractor is not present on any part of the work where it may be desired to give direction, orders will be given by the Engineer, and be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which the orders are given.

Engineer. (65.) Whenever the word "Engineer" is used herein, it shall be understood to refer to the City Engineer, and to his properly authorized agents, limited by the particular duties intrusted to them.

Contractor. (66.) Whenever the word "Contractor" is used herein, it shall be understood to refer to the party (or parties) who has entered into the contract to perform the work to be done under these specifications, or the legal representative of such party.

~~(67.) All facilities shall be given by the Contractor to the employés of the city for laying pipes, setting gates, etc., and generally for doing all work that may have to be done by the city.~~ Facilities to city employés.

D. It is hereby agreed that no claims for extra work shall be made unless the work shall have been done in obedience to a written order from the ~~chief~~ City or resident Engineer. All such claims are to be made to the Boston Water Board in writing before the payment of the next succeeding monthly estimate after the work is done; and, failing to make such claim within the time required, all rights of the Contractor to extra pay for such work shall be forfeited.

E. And it is further agreed that the work shall be commenced and carried on at such points, and in such order of precedence, and at such times and seasons, as may, from time to time, be directed by the Engineer.

F. The said part of the second part hereby further agree that will give personal attention to the fulfilment of this contract; and that will not sub-let the aforesaid work, but will keep the same under control; and that will not

assign by power of attorney, or otherwise, any portion of the said work, unless by and with the previous consent of the Boston Water Board, to be signified by endorsement on this agreement.

G. The said part of the second part hereby further agree that will commence the work within ten days of the execution of the contract; to commence and progress therewith so that by the first of _____, 187 , the value of the work done and the materials delivered shall at least equal one- of the value of the total amount of the work to be done and materials to be delivered under this contract; and by the first of _____, 187 , said value shall at least equal one- of said total amount; and by the first of _____, 187 , the whole work shall be completed in accordance with this agreement.

H. The said part of the second part further agree that if the work to be done under this agreement shall be abandoned, or if this contract shall be assigned by the part of the second part, otherwise than as herein specified, or if the conditions as to rate of progress are not fulfilled, or if at any time the Engineer shall be of opinion, and shall so certify in writing to the Water Board, that said work, or any part thereof, is unnecessarily or unreasonably delayed, or that said part of the second part wilfully violating any of the conditions or covenants of this contract, or fulfilling said contract in bad faith, the said Water Board shall have the power to notify the aforesaid part of the second part to discontinue all work or any part thereof, under this contract; and thereupon the said part of the second part shall cease to continue said work, or such part thereof as said Water Board may designate; and said Water Board shall thereupon have the power to place such and so many persons, and obtain by purchase or hire, such animals, carts, wagons, implements and tools as the Engineer may deem necessary, by contract or otherwise, as said Water Board may deem advisable, to work at and be used to complete the work herein described, or such part thereof as the Engineer may deem necessary, and to use such materials as may be found upon the line of said work, and to procure other materials for the completion of the same, and to charge the expense of said labor and materials, animals, carts, wagons, implements and tools, to the part of the second part, and the expense so charged shall be deducted and paid by the party of the first part out

of such moneys as may be either due or may at any time thereafter become due to the said part of the second part, under and by virtue of this agreement or any part thereof; and in case such expense is less than the sum which would have been payable under this contract, if the same had been completed by said part of the second part, then this said part of the second part shall be entitled to receive the difference; and in case such expense shall exceed the last said sum, then the said part of the second part shall pay the amount of such excess to the party of the first part, on notice from the said Water Board of the excess so due.

I. It is hereby agreed that the Contractor shall indemnify and save said City of Boston harmless from and against all claims against said city, under chapter one hundred and fifty of the General Statutes of Massachusetts, and any laws passed since the General Statutes, with reference to liens on buildings and lands, for labor done and materials furnished under this contract, and shall furnish the said Water Board with satisfactory evidence, when called for by them, that all persons who have done work or furnished materials, under this contract, for which the said City of Boston may become liable, have been fully paid or satisfactorily secured; and in case such evidence is not furnished, an amount necessary and sufficient to meet the claims of the persons aforesaid shall be retained from the moneys due the said Contractor under this contract, until the liabilities aforesaid shall be fully discharged or satisfactorily secured.

J. And it is agreed that this contract shall be in writing, and executed in triplicate, one of which triplicates shall be kept by the said Water Board, one to be delivered to the City Auditor of said Boston, and one to the Contractor; that this contract shall be utterly void as to the said city, if any person appointed to any office, or employed by virtue of any ordinance of said city, or any act of the Legislature relating to the supplying of water to said city, or any matter or thing connected therewith, is either directly or indirectly interested therein.

K. And the said part of the second part further agree that will indemnify and save harmless the said city and the said Water Board from all suits or actions, of every name and description, brought against the City of Boston or said Water Board, for or on account of any injuries or damages received or sustained by any party

or parties, by or from the said part of the second part, servants or agents, in the construction of said work, or by or in consequence of any negligence in guarding the same, or any improper materials used in its construction, or by or on account of any act or omission of the said part of the second part, or agents, and for the faithful performance of this contract by the part of the second part; and the said part of the second part hereby further agree that so much of the money due to under and by virtue of this agreement, as shall be considered necessary by the said Water Board, may be retained by the said party of the first part until all such suits or claims for damages as aforesaid shall have been settled, and evidence to that effect furnished to the satisfaction of the said Water Board.

L. And the said part of the second part further agree that the Water Board may, if it deems it expedient to do so, retain out of any amounts due to the said part of the second part sums sufficient to cover any unpaid claims of mechanics or laborers for work or labor performed under this contract; provided, that notice in writing of such claims, signed by the claimants, shall have been previously filed in the office of the City Clerk.

M. And the said part of the second part further agree that will execute a bond, in such sum and with such sureties as shall be approved by the said Water Board, conditioned to well and truly keep and perform all the terms and conditions of this contract on part to be kept and performed, and to indemnify and save harmless the said City of Boston and said Water Board as herein stipulated.

N. And the said part of the second part further agree that said City Engineer may make alterations in the line, grade, plan, form, dimensions or material of the work herein contemplated, either before or after the commencement of construction. If such alterations diminish the quantity of work to be done, they shall not constitute a claim for damages, or for anticipated profits on the work that may be dispensed with; if they increase the amount of work, such increase shall be paid for according to the quantity actually done, and at the price established for such work under this contract.

O. And the said part of the second part hereby agree to

receive the following prices as full compensation for furnishing all the material not found on the ground (except castings and other iron-work to be set in the masonry), and for use of tools, forms and other implements, and for labor in moving materials and executing all the work contemplated in this contract; also, for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstructions or difficulties which may be encountered in the prosecution of the same; and for all risks of every description connected with the work; also, for all expenses incurred by, or in consequence of, the suspension or discontinuance of said work, as before specified, and for well and faithfully completing the work, and the whole thereof, in the manner and according to the plans and specifications and the requirements of the Engineer under them, to wit:—

(*a.*) For all earth excavation and disposal of material in embankment or refilling of trenches (rolling, ramming and watering wherever required), in grading or regrading of roads and lands, or in spoil banks, including all clearing and grubbing, all sheeting and shoring, and removal of same, all coffer-dams, and removal of the same, accommodation of travel on intercepted roads, and all pumping, bailing, or otherwise disposing of water, the sum of _____

_____ ($_____) per cubic yard.

(*b.*) For all dressing of embankments or other surfaces with soil, the sum of _____ ($_____) per cubic yard.

(*c.*) For all rock excavation, including disposal of material, either in construction or in spoil banks, as may be required, the sum of _____ ($_____) per cubic yard.

(*d.*) For all concrete work in place, the sum of _____

_____ ($_____) per cubic yard.

(*e.*) For all brick masonry, the sum of _____

_____ ($_____) per cubic yard.

(*f.*) For all rip-rapping, the sum of_____ (\$_____) per cubic yard.

(*g.*) For all dry rubble-stone paving, in place, the sum of_____ (\$_____) per cubic yard.

(*h.*) For all masonry of rubble stone laid in mortar, the sum of _____ (\$_____) per cubic yard.

(*i.*) For all floor paving, laid in mortar, the sum of_____ (\$_____) per cubic yard.

(*j.*) For all masonry of dimension stone, with cut faces, laid in mortar, the sum of_____ (\$_____) per cubic yard.

(*k.*) For all masonry of dimension stone, quarry faced, laid in mortar, the sum of_____ (\$_____) per cubic yard.

(*l.*) For all spruce lumber, except that used for sheeting, coffer-dams, and other temporary purposes, placed, the sum of_____ (\$_____) per M. feet B. M.

P. And the said part of the second part hereby further agree that the said Water Board shall be and is hereby authorized to deduct and retain out of the moneys which may be due or become due to the said part of the second part, under this agreement, the sum of_____ dollars per day as liquidated damages for each and every day the aforesaid work may be uncompleted over and beyond the time herein stipulated for its completion. *Provided*, however, that said Water Board shall have the right to extend the time for the completion of said work if they should decide so to do.

Q. And it is further agreed by the parties to this contract, that the City Engineer shall make approximate monthly estimates, as the work progresses, of the work done and the materials delivered, and that payments shall be made of eighty-five (85) per cent. only, of the amount of said monthly estimates.

R. And the said part of the second part hereby further agree that shall not be entitled to demand or receive payment for any portion of the aforesaid work or materials except in the manner set forth in this agreement, nor until each and all of the stipulations hereinbefore mentioned are complied with, and the Engineer shall have given his certificate to that effect; whereupon the party of the first part will, at the expiration of forty days after such completion and the delivery of such certificate, pay, and it hereby binds itself to pay, the said part of the second part, in cash, the whole amount of money accruing to the said part of the second part under this contract, excepting such sum or sums as may be lawfully retained under any of the provisions of this contract hereinbefore set forth: —

Provided, That nothing herein contained be construed to affect the right, hereby reserved, of the said Water Board to reject the whole or any portion of the aforesaid work, should the said certificate be found or known to be inconsistent with the terms of this agreement, or otherwise improperly given.

In witness whereof, The parties to these presents have hereunto set their hands and seals, the year and day first above written.

For the City of Boston by the BOSTON WATER BOARD.

_____ *Chairman.* (Seal)

_____ (Seal)

_____ (Seal)

_____ (Seal)

_____ (Seal)

SIGNED AND SEALED in the presence of

_____

_____

_____

Know all Men by these Presents,

That we, _____

_____

_____

_____

_____

are held and firmly bound unto THE CITY OF BOSTON in the sum of _____ dollars lawful money of the United States of America, to be paid to the said CITY OF BOSTON, or its certain Attorney, its successors and assigns, for which payment, well and truly to be made, we bind ourselves, our heirs, executors and administrators, jointly and severally, firmly by these presents.

Sealed with our seals, dated the _____ day of _____ in the year one thousand eight hundred and seventy-seven.

Whereas, The said _____

_____

_____

ha entered into a contract with THE CITY OF BOSTON, by the Boston Water Board, for building Section _____ of the Sudbury River Conduit, bearing date the _____ day of _____ one thousand eight hundred and seventy-seven:

Now the condition of this Obligation is such,

That if the said _____

_____

_____

shall well and truly keep and perform all the terms and conditions of the said contract on _____ part to be kept and performed, and shall indemnify and save harmless the said CITY OF BOSTON and said Board, as therein stipulated, then this obligation shall be of no effect; otherwise it shall remain in full force and virtue.

_____ (Seal)

_____ (Seal)

_____ (Seal)

_____ (Seal)

SIGNED AND SEALED in the presence of

_____

_____